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A Better Angle on Hadron Transverse Momentum Distributions at the EIC

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We propose a novel observable q_*, sensitive to transverse momentum dependent distributions (TMDs) in the SIDIS process $eN \rightarrow ehX$, with q_*/E_N defined purely by lab-frame angles. We prove factorization for $\mathrm{d}\sigma_h/\mathrm{d}q_*$ for $q_* \ll Q$ with standard TMD functions, enabling q_* to substitute for the hadron transverse momentum P_{hT}. A double-angle reconstruction method is given which is exact to all orders in QCD for $q_* \ll Q$, allowing for angular reconstruction of Q, x, y. Resummation and convergence of perturbative QCD predictions for q* will also be discussed. By replacing measurements of $\mathrm{d}\sigma/\mathrm{d}P_{hT}\mathrm{d}\phi_h$ by $\mathrm{d}\sigma/\mathrm{d}q_*$, the prospects for precisely mapping the 3D structure of hadronization and confinement with TMDs are bright. We show that q_* enables an order-of-magnitude improvement in the expected experimental resolution at the EIC.

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